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MEDIUM STRUCTURAL STEEL: AN OLD PRODUCT FINDS A NEW IDENTITY



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STRUCTURALS:

THE MINI-MILLS ARE GETTING ON THE BEAM

The smaller steelmakers are moving into the bigger sizes and joining the market battle between the big mills and their foreign competitors.

BY GEORGE J. MCMANUS

"Our dedication to this end of the business is unflinching," says George E. Trainor, general manager of sales and marketing, Bethlehem Steel Corp.

Mr. Trainor is referring to the structural end of the steel business, with particular emphasis on wide flange beams.

Bethlehem isn't flinching; it is planning a complete modernization of the 48-in. mill at Saucon Works, the Free World's largest structural plant.

However, the company may grimace a little when it considers that three new mills have been built for the structural market. In 1981, Chaparral Steel Co. began operating a 1-million-ton medium section mill at Midlothian, Texas.

The same year, Bayou Steel Corp. started its 500,000-ton medium section mill at La Place, La. Due for startup this fall is the 400,000-ton medium section mill of Ohio River Steel Corp. at Calvert City, Ky.

Taken together, the three mills add nearly 2 million tons of structural rolling capacity to the market. In 1982, the domestic industry's shipments of structurals were a little over 3 million tons. That was the lowest total in over 20 years and shipments so far in 1983 are down another 20 pct.

In short, a big slug of new capacity is bearing down on a depressed

market and a market that has been reserved for integrated mills. The market thrust isn't brand new; mini-mills moved into the lower end of the structural market sometime ago.

However, the new installations greatly expand the structural size range of the electric furnace companies.

And for the first time, these companies are equipped to roll wide flange beams, the star products of the structural steel market.

All of which might suggest a repeat of the sequence that saw mini-mills take over the merchant bar market and the integrated producers back away from that market. There will probably be some shifting of domestic positions, but

it is not just a case of mini-mills versus maxi-mills.

"They will find their niche," says Mr. Trainor of the electric furnace mills.

A large part of that niche has already been vacated by the traditional structural mills. "It will probably come principally from imports," says Jeffrey A. Werner, senior vice president, commercial, for Chaparral.

Mr. Werner explains that imports have taken over a big chunk of the structural market. "In the South," he says, "the integrated mills had been displaced two years ago."

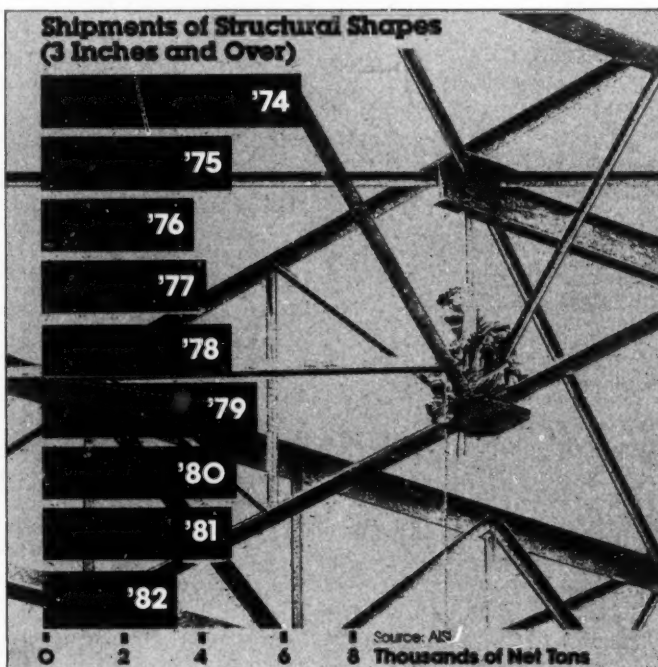
The displacement resulted from import prices that were about \$150 a ton under domestic levels, he adds. He also adds that Chaparral is meeting the foreign producers head-on.

"We're closely competitive with imports. We've been growing each month."

It's worth noting that the original mini-mill growth in merchant bars was partly at the expense of imports. The merchant bar market was one of the first to be hit by foreign steel. By 1963, imports of rebars and bar shapes were over 850,000 tons or 15 pct of the foreign total.

As the mini-mills expanded, they pushed foreign mills as well as domestic tonnage producers out of the market. By 1981, only 150,000 tons of rebars and bar shapes were imported. That was less than 1 pct of total imports.

(Cont. on p. MP-5)



In the structural field, as Mr. Werner indicates, there are grounds for believing mini-mill expansion will be mostly a matter of recapture-business from imports. For one thing, foreign steel presents a large target. The 1.5 million tons of structural steel imported in 1982 represented nearly a third of domestic supply.

Secondly, the positions of domestic mills are pretty well defined by size capabilities. The American Iron and Steel Institute classes all shapes over 3 in. as structurals. The new section mills definitely fall in this class.

Within the broad group, says one producer, the dividing line between heavy and light structurals is around 40 lbs a ft. The new mills concentrate on the lighter end of the line. This is not a small portion; about half the wide flange beams produced are light.

Among the established mills, the impact of new competition varies widely. Chaparral goes up to 12 in. on wide flange beams and channels. For one structural plant, this range coincides with 33 pct of the plant's mix.

On the other hand, Bethlehem goes up to more than 36 inches on wide flange beams and up to 730 lbs a ft. On standard structurals, Bethlehem goes up to 24.5 in. and to 121 lbs a ft. United States Steel Corp. also produces king-sized structurals. Inland's 28-in. wide flange mill is another that turns out big beams.

The new section mills now reach only 5 to 15 pct of the wide flange market served by the biggest producers. The size range could change, but production of the jumbo beams is probably not compatible with mini-mill economics.

"To get into much larger sections requires larger blooms and some pretty large rolling mills," says John W. Cox, Inland assistant general manager for heavy products marketing. "That gets into big bucks."

In terms of marketing practices as well as size, the newer electric furnace mills seem pointed more toward import than domestic competition. Imported structurals are produced in standard lengths and are sold mostly through service centers.

Chaparral follows the same general pattern. The company will supply structurals in special lengths, but only if the quantities are above a certain minimum.

Bethlehem, Inland and U. S. Steel prefer orders for structurals cut to special lengths and shipped directly to fabricators. Equipped with reversing mills, the tonnage producers are geared to special lengths and special strength requirements. The continuous mills of the new structural companies are designed more for standardized volume.

Finally, the traditional mills are not ready to write off the entire structural business. There have been some strong reactions to mini-mill and import competition. Last July, Northwestern Steel & Wire Co. came out with its "import fighter program." This provided a price cut of \$138 a ton on wide flange beams and channels in certain sizes.

In a related field, Inland slashed \$89 a ton off the price of bars made from scrap in electric furnaces. The cut was

Mr. Cox of Inland feels the slow climb back has started. Demand for structurals is up 10 to 15 pct from last year's low bottom, he says. Still very weak, he adds, are the freight car, machinery and industrial construction sectors.

Not everyone is prepared to wait for a full recovery in 1984. Armco, Inc., has permanently closed its structural mill at Houston. U. S. Steel suspended structural operations at Fairfield, Ala., a year

IMPORTS AND EXPORTS OF STRUCTURAL SHAPES—3" & OVER

Year	Net Tons	
	Imports	Exports
1982	1,483,481	56,398
1981	1,976,796	131,379
1980	1,739,543	151,077
1979	1,881,967	139,062
1978	1,798,963	124,445
1977	1,743,228	96,551
1976	1,361,365	97,507
1975	812,429	170,213
1974	1,150,325	356,867

Source: AISI

aimed specifically at mini-mill competition.

These competitive brushes point up the impossibility of isolating the fight between mini-mills and imports. "It's the old pebble in the water kind of thing," says Mr. Cox of Inland. "I don't think you can bring that much tonnage on stream and not impact the whole market."

Equally cautious is S. S. Higley, general manager of structural products for Jones & Laughlin Steel Corp. (J & L). "I think it's foolhardy for our competition to say that they (the mini-mills) are really directing their production at imports," says Mr. Higley.

With a structural line that includes Junior Beams from 6 to 12 in. and wide flange beams up to 6 in., J&L is very much in the size range of the new section mills.

"We feel that long term our mission is to be positioned as a low cost producer regardless of who the competition is," says Mr. Higley.

What makes the competition so intense is the depressed state of the structural market. "The market is in the doldrums except for some highway programs," says Mr. Trainor.

"We really don't see a whole lot," says Mr. Werner of Chaparral. "There's some utility construction. The only other significant area is the Federal highway program."

Mr. Trainor is optimistic. "Good times for us are due in 1984," he says. The highway program will be "bigger than anyone thought it would be."

ago. U. S. Steel's standard structural mill at South Works is down and is scheduled to be modified for rail rolling.

Temporarily idled is the structural mill at U. S. Steel's Geneva Works. The rolling of light structurals has been suspended at Gary Works. Still operating are U. S. Steel's wide flange mill at South Works and a small structural mill at Clairton Works.

Also operating are two structural mills at U. S. Steel's Homestead Works. However, production there has been supplemented by the purchase of light structurals from Northwestern Steel & Wire.

Bethlehem continues to operate its two mills at the Saucon plant. CF&I has temporarily halted the operations of its two structural mills at Pueblo, Colo.

Northwestern Steel & Wire suspended all melting and rolling operations except for wire during labor negotiations in June.

Northwestern was selling structurals from inventories—at the import fighter price.

Inland Steel Co., which has been putting 7-8 pct of its output into structurals, is operating its Indiana Harbor complex.

As of late June, Chaparral was operating its overall plant at 70 to 75 pct of capacity. The medium section mill was running at about 55 pct of capacity and its workload was steadily being increased.

With 1 million tons of melting capacity and 1.5 million tons of rolling capac-

ity, Chaparral doesn't consider the designation, mini-mill, appropriate. The company calls itself a market mill and the market now extends to 44 states. (The strategy that has gone into this growth was examined in detail in *Iron Age*, June 6, 1983, p. MP-21.)

Apart from strategy, Chaparral has probably benefitted from production cuts elsewhere. With the Geneva and Pueblo mills down, Chaparral is the closest supplier of structurals to the West Coast. With a permanent shut-down at Armco in Houston and with Fairfield down, Chaparral and Bayou are the only Southern producers of medium sections.

Most important of all, the new section mills are designed for a high degree of efficiency. This is basic to the mini-mill concept; you have to have costs that permit competitive selling in the toughest markets.

Both Chaparral and Bayou have modern electric furnace shops. Both are 100 pct continuous casting.

At Chaparral, the 23-in. section mill was designed by Schloemann-Siemag. There are four vertical stands, seven horizontal stands, and five combination stands. The combination stands can be used for universal rolling of wide flange beams or two-high rolling of standard structurals.

Universal rolling is one of the features that sets the medium section mill apart from merchant bar mills. Bar shapes and standard structurals are rolled on fixed pass mills; the shape is imparted by a profile cut into the roll.

Wide flange beams are formed by the vertical and horizontal rolls of the universal mill. The shaping action is such that you can roll a beam with a narrow web and wide, parallel flanges. Since it is the flanges that do the work, this distribution provides maximum strength for a given amount of metal.

The first U.S. application of the universal concept was at Bethlehem in 1907. Using the design of Henry Grey, the company built the 48-in. structural mill that is still operating at Saucon.

That mill brought fame and fortune to Bethlehem; the wide flange shape is still incorporated in the company's emblem. And the wide flange beam is still the basic strength member for sky scrapers and various types of heavy construction.

"It's the guts of the building industry," says Mr. Trainor.

Mr. Werner says something like this is describing the product mix of Chaparral's section mill. "Wide flange is by far the strongest product."

The size range of the Chaparral mill helps to identify medium structurals. The mill starts at 2 in. on angles, 3 in. on channels, and 5 in. on flats. Upper

limits range from 6 in. to 12 in. With its original bar mill, Chaparral goes up to 4 in. on angles, channels and flats.

Rapid roll changing, in-line straightening, and automatic stacking are among the features of the Chaparral mill. The operation is fully continuous and rolling is tension-free.

The Bayou section mill, which was designed by Danieli, has a six-stand blooming train, four intermediate stands, and a five-stand finishing train. The last finishing stand can be converted from two-high to universal for wide flange beams.

According to Danieli, the mill is equipped for fast roll changing, in-line straightening, and fully automatic bundling, tying, and weighing.

"It is a very versatile mill," says Albin Palczynski, executive vice presi-

The mini-mills are benefitting from low scrap prices now.

dent, Danieli of America, Inc. "The product span is fantastic."

To roll rounds as small as $\frac{1}{2}$ in. and channels up to 6 in., says Danieli, the mill is designed to operate in one of three modes: The first six stands; the last nine stands; or the whole mill.

Ohio River Steel will have a non-integrated operation initially. Semifinished steel will be obtained from outside sources, domestic and foreign. Mechanical equipment for the mill is coming from Equipamentos Villares of Brazil under license from Schloemann-Siemag. Siemens of West Germany is providing the electrical equipment.

"We feel our mill will be about as modern as any in the world," says Wolfgang Jansen, chairman of Ohio River and also head of Intercontinental Metals Corp. of Charlotte, N.C. "The mill is fully computerized. It will be a highly productive and efficient mill."

Ohio River will be turning out angles, flats, channels and I-beams ranging from 4 to 10. Plans call for the eventual expansion to 750,000 tons and the installation of melting furnaces.

Mr. Jansen feels the timing of the project is good. "With the economy recovering," he says. "We think by the time the fourth quarter rolls around, the market ought to be in halfway decent shape."

Both Ohio River and Bayou have foreign ties. Owners of Ohio River include West German and Saudi Arabian interests along with Intercontinental. Financing of the \$65 million project includes a \$45 million secured loan from Banco do Brazil. Bayou is owned by a

European group that includes Voest-Alpine of Austria. Chaparral is a joint venture of Co-Steel International, Ltd., and Texas Industries, Inc.

Just how the structural market will shake out is anybody's guess. J&L, for one, is confident it can be competitive on cost. The company's structural products group has its attention focused squarely on this one market area. J&L's 14-in. bar mill at Aliquippa, Pa., was built in 1926, but it has a fairly unusual design. Like the merchant mills and the new section mills, it can roll a variety of shapes. More typical of integrated bar production today are mills that roll only rounds and other solid, symmetrical products.

Also like the new section mills, the Aliquippa unit is continuous and is equipped for universal rolling. Unlike many of the mini-mills, however, J & L is organized by the United Steelworkers of America.

"We've got a cooperative effort here at Aliquippa with our labor-management productivity teams," says Mr. Higley. "We're working to correct restrictive work practices and eliminate inefficiencies."

The mini-mills are benefitting from low scrap prices now, he says, but when the economy recovers, fixed hot metal costs will give integrated mills the edge. J&L feels it also has the advantage of a specialized market situation. Its light structurals go mostly into mobile homes and manufactured buildings.

Another unique mill could soon become a factor in the structural market. At Monessen, Pa., Wheeling-Pittsburgh Steel Corp. is operating a modern rail mill. The company has said it can, and will, roll structurals on this when the market improves.

When the improvement does come, it will be interesting to see how much structural capacity is available. The push of mini-mills into structurals has brought a profound change, says one official. When demand lagged in the old days, he explains, everyone cut production and operated a few turns a week.

Today, says the same official, the mini-mills cut prices and try to maintain maximum output. The result is that some mills are operating at high levels and others not at all. Some of the idle mills are being permanently closed.

The ultimate effect, says the official, will be to bring capacity down to the business levels of weak markets. There will be no reserve available for the recovery. □

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FOUNDRIES ARE WARMED UP FOR THE RECOVERY

Despite some shutdowns, industry members have added quality control programs and revamped their production methods for the coming upturn.

BY KEITH W. BENNETT

Since January, foundrymen have been reporting mild gains in business. It's about time.

If you need problems, ask a foundryman. Last year, his industry's shipments fell 35.6 pct. Even with the recovery of 1977-78, gray iron tonnages have slipped an average 8 pct per year since the 1974 peak.

The three-year squeeze wiped out a lot of foundries, both captive and jobber. It has scared castings buyers, who remember the shortages of 1978-79. What might make them even uneasier

is the extent of the recovery in some shops. Some automotive-supplier foundries now are running at capacity. Some auto captives will forego their usual summer shutdown; the demand is that good.

But there may be a bigger surprise: Another wave of new investment is shaping up on the foundry front. There have been inklings of it since January, but in a period when foundries have been running at 20 to 40 pct of capacity—sometimes for two years—nobody expected much new buying of equipment before 1984.

But what about that shrinking foundry capacity? Much of the tonnage

loss was in captive high production foundries, designed for big auto engines. And in 1981 and 1982, despite the continuing decline in business, foundries were still bringing on new machinery and furnaces they'd contracted for in the mini-boom of 1977-78.

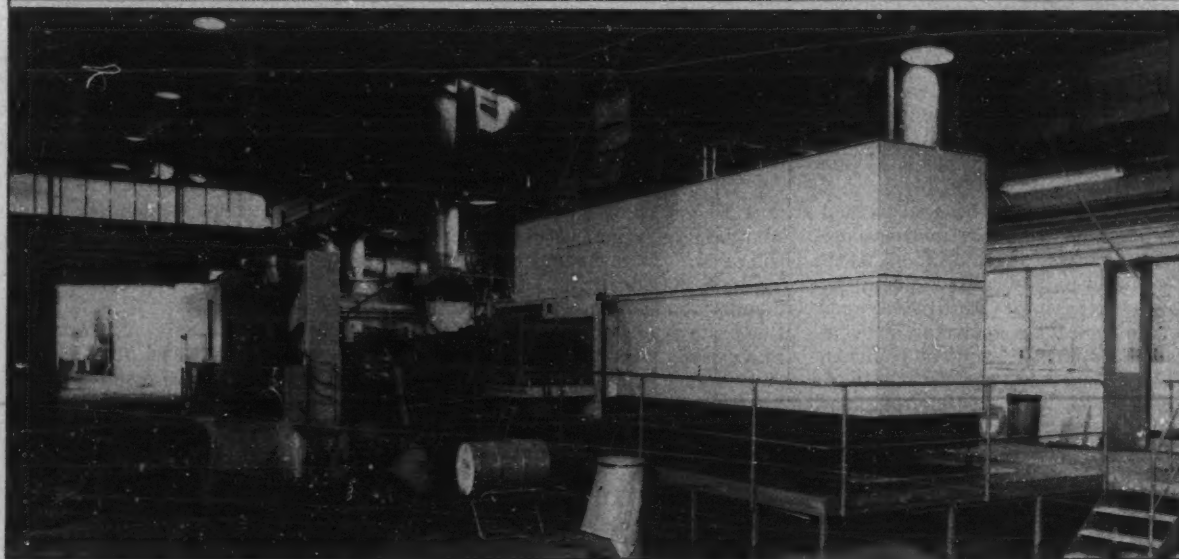
John Ircink, executive vice president for Kenzler Engineering Co., Inc., Milwaukee, says there is activity on both coasts, though the Midwest is still a little slow.

He points out that foundries, including the smaller ones, were automating in the mid-1960s, when matchplate molding machines allowed a lot of smaller shops to automate for an in-

Ferrous Castings, Shipments (Tons)

	Gray Iron	Ductile Iron	Malleable	Steel	Total
1982	6,421,000	1,805,000	286,000	1,088,000	9,600,000
1981	9,729,000	2,201,000	421,000	1,743,000	14,904,000
1980	9,399,000	2,400,000	450,000	1,878,000	14,127,000
1979	11,899,000	2,694,000	724,000	2,025,000	17,342,000
1978	12,417,000	2,896,000	803,160	1,829,670	17,945,830
1977	12,295,000	2,694,000	828,000	1,718,000	17,535,000
1976	11,045,568	1,887,460	847,612	1,802,340	15,582,980
1975	10,621,700	1,824,500	730,700	1,938,000	15,114,900
1974	13,488,900	2,202,300	914,300	2,090,300	18,695,800

Source: U.S. Department of Commerce





Squeeze molds form white iron coal pulverizer balls at Babcock & Wilcox's Iron Foundry. The balls are used by electric utilities to crush coal.

vestment of only \$50,000. Kenzler engineered the V-Process steel casting plant at Duluth built by Minneapolis Steel Casting in the 1970s.

"There's a buying swing, from purchasing a 'casing,' to buying a finished part, especially in nonferrous where aluminum disc brake calipers are only starting to come," he says.

Modern Equipment in Port Washington, Wis., a foundry cupola specialist and a subsidiary of Alco Standard Corp., reports a wave of interest in retrofit of existing cupolas. "The market is in retrofit," says Donald Donner, general sales manager, "rather than new capacity. The auto foundries are a prime candidate for retrofit and they've been more active in recent months."

Says F. P. Kaiser, Modern's sales vice president, "There's more desulfurization outside the furnace, a return to refractory lining with a watercooled shell, hotter furnace blast, and a real revolution in the use of programmable controllers." From a 1200°F blast now, he can see 1400°F installations and 1600 to 2000°F hot blast still to come. Charging computers, right at the cupola, are on the way, he notes. Modern Equipment is itself probably going to announce some new licensed technology later this year as the trend develops.

Carl Weigell, president of Motor Castings Co., Milwaukee, would certainly agree. Motor Castings is a cupola foundry pouring gray, ductile, and compacted graphite irons in two plants capable of over 3,400 tons per month. As foundries battle a minor flood of import castings, quality control and value added are key weapons.

Motor Castings recently spun off as a separate unit its own pattern and mold high tech shop. CasTech, this new unit, will also machine castings on a job ba-

sis. The closing of some big captive foundries (Allis Chalmers closed a foundry next door to Motor Castings' main plant.) has brought some new customers to Motor Castings. The foundry pours castings from 100 lbs to 5000 lbs, including complete diesel and gasoline engine blocks and heads.

Mr. Weigell uses a phrase that will be heard more often in the future—statistical process control. His foundry even conducts seminars on the subject for suppliers.

"You don't monitor the results of your work, as much as you measure the process itself at every point," says Thomas Guthrod, sales vice president. "It took a year to develop our statistical process control, and it's our most important job today."

It means more measurements, more instruments and more programmable controllers in the foundry. "By 1985, Modern expects to have all of its products under SPC.

"U.S. companies developed a lot of technology they didn't apply," says Mr. Weigell. "They let the Japanese do it. That technology is available and useful."

"We set up CasTech last year and it was an overnight success. It already does 20 pct outside business and by next year the biggest part of its output will be for outside customers."

Grede Foundries, Inc., is a multi-foundry complex with plants in three states. Its aggregate capacity probably totals nearly 10,000 tons per month in gray, ductile and compacted graphite irons.

Grede Chairman Burleigh Jacobs is a keen advocate of the quality drive. Its program is called "Grede's Reliability in Product" (GRIP). It took almost three years to install the program, but it also calls for intensive measurement of

every step of every process.

Walking through Grede's Reedsburg, Wis., foundry with plant manager Bru Newton, you'll see specification books bigger than a couple of mail order catalogues at each machine. These include pictures of each part the plant produces. Each operation is recertified each year by a corporate team that includes operations and quality control vice presidents. The workers also sit in on the process, analyzing every part and every job. Process cards in the big catalogues describe, with graphics, each step of a job.

Basically, the worker on each machine in the foundry audits its output, whether molder or grinder or melter. Training can take four months and involves both machine and classroom time. Employees meet weekly with their supervisors and maintain their own machine data charts.

Grede and Motor Castings are job foundries. Deere & Co.'s captive East Moline ductile foundry is a \$6 million investment by a farm machine builder. It's part of a complex of three Deere foundries that can pour 30,000 tons per month by one estimate. Donald Grundstrom, who helped create Deere's Waterloo foundry, heads up this newest addition.

The East Moline foundry can pour castings, ranging from a few lbs to one ton. (About 70 pct of the weight of a farm tractor is castings.) East Moline's five molding lines typically handle from 25 to 300 castings.

This is an electric arc melting shop, with high pressure molding. Unlike General Motors, Deere doesn't have a Central Foundry division. But, Mr. Grundstrom points out, the three foundries keep close tabs on new technology. He's already looking at a robot grinder similar to one in use at Waterloo. The three also share inventory stocks of low value, but keep their own high value items, like bearings and gear cases, for rapid maintenance.

"Today's demand is for shorter casting runs," Mr. Grundstrom points out. "The handling systems allow us to run on 'just-in-time' delivery systems. It is looking at outside jobbing sales, as General Motors has done, so its entry into job work offers a net gain in ductile market capacity."

Another big captive, Caterpillar Tractor's Mapleton foundry, is also eyeing the outside market for some of its output. Its big B and D foundries can probably pour up to 30,000 tons of castings per month, pretty much the same output as the Deere complex.

Like Deere, it has added melt capacity, with another Whiting arc furnace to feed metal for a second, new cylinder

liner line, built by Kunkel Wagner. The arc furnaces feed what's been principally a gray iron foundry, but one that is increasing its ductile iron output, says R. L. Claussen, plant manager of the two Mapleton foundries.

In past foundry market upswings, ductile has been particularly sensitive to demand changes, though even gray iron castings in the larger sizes can be in short supply when the market stages a sudden recovery.

"Our engineers are calling for higher strengths," Mr. Claussen points out, "which means more compacted graphite and ductile irons. That is more difficult to machine than gray iron, especially in deep hole drilling, since it acts more like steel. It's a problem that needs some work by tooling manufacturers. You can't machine dry like you can with cast iron."

Caterpillar runs, at D plant alone, two SPOMATIC lines, going to a third shift to get better energy rates, a common practice in jobbing foundries. The plant makes engine blocks and compacted graphite heads on two lines.

This is a robot-using foundry. Eight robots dry molds with blowtorches, two spray the molds, and two robots "vent" molds for gas escape. Besides Unimate and Cincinnati Milacron robots, there

are three GE Manmates.

Harmony Castings, Inc., is unique in being a V-Process foundry for aluminum castings. It started out in 1980 and built its own equipment, notes Harmony President W. J. Willmot.

"Our timing wasn't the greatest," admits Mr. Willmot, "but each month has been better than the last, and the future looks great." He markets to some high-tech industries, including lasers, portable controllers and computers.

V-Process is a precision process that cuts the machining needed on the castings. Since the process doesn't use binders, there's no need for shakeout systems.

William Kaveny is president of the Herman Corp. and Herman-Sinto V-Process Corp., which holds the U.S. license for V-Process equipment. "V-Process in the U.S. started in steel foundries," he explains. "But has now moved into aluminum and iron. In fact, the most interest right now is in iron castings. The steel installations were bigger castings, but iron foundries are looking at mid-sized, 20 lbs to 59 lbs castings, which means they will want faster output from this process. Where you'll see mold speeds of five to ten molds per hour in steel, now we'll see rates in iron of 40 molds to 100 per

hour. One top-rated line is already at 60 molds per hour and bids are out for higher speeds."

He believes that capital spending by the foundry industry is beginning to look up, though the real gains won't come till the fourth quarter.

Concerning the move to smaller castings sizes in V-Process molding, Robert Seidel, vice president of Harmony Castings notes: "We can break a single (mold) plate into 18x24 in. or 24x36 in. sections, so we can get four different jobs per cast. We'll run 20 pieces and already have had runs as long as 1,000 pieces."

Harmony, with this process needs less machining, but will ship machined castings if the customer wants them, subcontracting the work. It can run its single molding line with five people, but is up to 12 now because volume has risen.

There are younger foundries than Harmony, even in gray iron. Fargron Foundry, Inc., St. Louis, poured its first iron in May, says its president, Thomas Farquhar. This new plant is rated at between 600 and 1,000 tons of castings per month.

Fargron is melting gray iron in a Brown Boveri coreless induction furnace, feeding its metal output into a

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For Information, Circle 132

Disamatic automatic mold line. With new equipment like this, smaller foundries can run 400 molds per hour. These are mainly for auto parts which is proving to be a fairly healthy market this year.

Sibley Machine & Foundry Corp., at South Bend, Ind., started in 1874. But William Voll, its president, says that Sibley began a shift from a combination cupola/electric melt system to all-electric melting last year, when it bought a Brown Boveri induction furnace. "Now, we're wondering if it's time to add another electric," he says, "since we can begin to see need for more capacity."

Shrewdly, Sibley left its cupola on standby. Presently, it can ship 1,000 tons per month of castings, machining about 20 pct of what it casts. "Precision machining," Mr. Voll adds, "is a real, coming market. This isn't just rough machining, but precision machining, done in our own Machinery division plant."

Babcock & Wilcox has its own three-foundry complex based in Barberton, Ohio. A small alloy steel foundry does induction melting; a gray and white iron foundry (with some steel castings output) is built around two Lectromelt arc furnaces; and in 1980 it put up a V-

Process plant that can handle castings of 25 to 2000 lbs. All three foundries are part of Babcock and Wilcox's Nuclear Equipment division.

Last year, says Richard Pummell, manager of interdivisional products, the division also rebuilt its two arc furnaces at plant No. 2. (gray iron) with new shells, new controls, and an upgraded power factor. "It gives us greater flexibility, especially in large castings," notes Mr. Pummell.

Of electric furnace retrofits, Gregory Uren, foundry sales manager of Lectromelt, agrees that 1983 is more active than 1982 in fitting 'state of the art controls' to existing arc furnaces, both in captive and job shops. "Maybe 50/50 between the two, particularly in steel shops. The cost can range from \$35,000 to \$80,000 and give off a payoff in as little as three months, or up to one year."

Harry Munn, manager of market development for Disamatic, says his firm can see definite recovery in the (foundry capital goods) market place.

"We chart spare parts against tons of castings, and this figure began to advance in the April-May period," he adds. "Quotes are particularly up from industries that had been quiet, like automotive. Everybody wants lower man-hours per tons of castings, closer toler-

ances and closer reproducibility."

As examples, he mentions higher molding speeds and increasing demand for PC interfaced equipment.

Benton Foundry, Inc., at Benton, Pa., just put in a new top blow machine for coremaking, notes T. G. Brown, it's financial vice president. "It eliminates some gluing and pasting on what used to be oil cores. Where we got 100 cores per day on the old equipment, we get 600 to 700 on the new."

Foundries didn't lie down and die despite the seemingly bottomless plunge in 1982-83. Atlas Foundry Co., Inc., (1,000 tons per month), Marion, Ind., just added a new Disamatic molding line and core machines, says John Gartland, its president. It's a cupola melt operation, with runs from five pieces to 40,000 in weights to 70 lbs.

By all odds, it's too early in a recovery cycle for foundries to begin new capital programs. And in a disaster like 1982, it seemed almost impossible. But they did it, and in the face of some of the stiffest foreign competition they've yet faced. □

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Robotics Industry: A Different View of Tax Incentives

Leading representatives of the robotics industry met with the Commerce Secretary Malcolm Baldrige earlier this year to outline two necessary government actions that will assist them—Federal standards-setting activities and continued government-sponsored research within universities and public organizations.

"U.S. government policy contains few measures aimed specifically at the robotics industry," the group said in a prepared statement. "None of them address the demand side of the market, so that robot use derives from traditional economic considerations. The programs in place bear only upon robot producers and the connection is often indirect."

There are several proposals for governmental actions that could help foster high technology enterprises. Among these are tax incentives specifically aimed at promoting automation (accelerated depreciation and tax credits are examples). According to some proponents, such steps would directly increase robot usage across a modest range of industries, ultimately generating improvement in productivity, output quality and industry competitiveness.

But arguments against such incentives, as put forth in the robotics industry's presentation, say these steps "might introduce distortions into the existing capital-labor balance among user industries, distortions that could, in the long run, prove economically unjustified."

Also, the proposed tax moves could divert investment capital away from other types of manufacturing activities and channel demand away from other valuable investment markets."

Another drawback: Tax changes could set a precedent and serve as a lobbying point for other automation-related industries such as computers.

Another related idea is more extensive U.S. government encouragement of R&D "relevant to both user and producer firms," according to robotics specialists. This, again, would be through tax policy or publicly supported

projects. However, opponents point out this has already been done to some extent through, for example, credits in the 1981 Economic Recovery Tax Act (ERTA).

Say the robotics representatives: "The long-term effects and adequacy of those measures have yet to be determined and it may be prudent to postpone further action until some assessment can be made."

They point out: "The accelerated depreciation schedules for R&D equipment, now in place under ERTA, should provide significant and secure incentives for corporate investments in this area."

U.S. Robotics Industry

	1980	1981	1982	1983	1985	1990
Sales (millions of \$)	90	155	205	270	540	2,070
Production (units)	1,450	2,100	3,775	4,000	7,715	31,350

Source: Robots VI Conference

A potential shortcoming of a stepwise R&D credit could be its lack of stimulus for young, fast-growing companies characteristic of research-intensive sectors and from which has come an impressive proportion of technological innovation."

In the international sphere, the robotics presentation said the upcoming Congressional steps to renew the Export Administration Act "does provide an opportunity for debate over the methods and content of current government policy practices." Government policies in the area of export control will clearly be attempts to balance sometimes conflicting objectives and any Federal attempt to dictate a particular solution would prove highly problematic.

As part of reviewing the Act, the robotics industry says, it could be appropriate to re-emphasize the priority of technology transfer over products as a guiding principle for national security considerations.

Reagan has said.

"There are some things which the government could do in the fiscal area that would be of great benefit to the international competitiveness of the computer and other high technology industry," says Stephen G. Jerriets, Sr., vice president, Honeywell Inc.

Mr. Jerriets points to the 25 pct tax credit on increases in qualifying R&D expenses and says it should be made permanent and liberalized. It is due to expire after 1985. "From now until 1985 is not long enough to expect a wholesale improvement in the R&D plans of American industry," he adds.

The White House asserts that President Reagan is supporting legislation that would extend the 25 pct tax credit for R&D expenditures for three years beyond 1985. "We are in favor of providing special tax incentives for R&D," says Mr. Milbergs. "And we're concerned about how they're working and how they can be made better."

The White House also points out that it helped reduce the capital gains

tax, thereby making more venture capital available.

Recently, Treasury regulations were passed which would have limited the deductibility of R&D expenses for companies that sell their products overseas. Later, they were suspended. Mr. Jerriets says the suspension should be made permanent.

"Over a period of time," he adds, "these steps will increase the productivity and competitiveness of American industry. It is true that the 1981 and 1982 depreciation changes have had little effect on cash flow in the computer industry. However, we do believe they have had a positive impact on the economy as a whole and, not incidentally, on many of our important customers."

"Antitrust law needs to be modified to grant binding antitrust exemption, applicable to private as well as government lawsuits, for approved R&D joint ventures," says Mr. Jerriets. "Such exemptions would enable U.S. companies to combine complementary resources and skills to accelerate innovation and

avoid duplication of effort."

The White House, in order to encourage private sector investment in R&D, says it is helping to ease concerns that cooperative R&D may violate antitrust regulations. It is promoting private sector arrangements that allow firms to conduct research and development efforts that might be too expensive for an individual firm to undertake."

On Capitol Hill, Rep. James Sensenbrenner (R., Wisc.), has introduced legislation to modify state and Federal antitrust laws to allow more joint R&D ventures.

Mr. Jerriets also suggests an "official" identification of declining U.S. industries and allowance of "definite antitrust exemptions for appropriate mergers, consolidations, transfers, rationalizations and other cooperative action between companies within those industries."

Foreign trade and U.S. government policies in that area rank high in the high tech sector's concerns as vital for expansion. In talks with Commerce

MATERIALS NEWSFRONT

Price & Production Data

Steel production by districts, thousands of tons
(000 omitted)

	Last Week	Two Weeks Ago	Month Ago	Year Ago
North East Coast	172	156	203	148
Buffalo	32	32	32	5
Pittsburgh	206	179	199	152
Youngstown	76	81	109	61
Cleveland	129	137	115	113
Detroit	147	137	134	123
Chicago	460	474	408	343
Cincinnati	89	96	97	77
St. Louis	70	69	74	42
Southern	136	135	137	117
Western	88	85	85	65
U.S. Production	1,605	1,581	1,593	1,246

Source: American Iron & Steel Institute

Lake Superior Ore Prices

51.50% Fe Natural delivered lower Lake ports. Rail transportation, handling and unloading may be charged to the account of the buyer. Coarse ore 80% premium.

Pellets (per iron unit natural)	gross-ton 80.50-86.9*
Old range, non-bessemer	gross-ton \$32.78
Mesabi, regular-unscreened	gross-ton \$32.53
Mesabi, non-bessemer	gross-ton \$32.25-32.53**

*80.50¢—Pickands Mather as of 1/27/81.
**80.94¢—U. S. Steel as of 3/15/82. Cleveland-Cliffs as of 2/26/82. Oglebay Norton as of 3/25/82, and Hanna Mining as of 2/26/82.

Nonferrous Prices

(Effective July 18, 1983)

Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated.

Primary Metal Prices

(cents per lb.)	current price	last price	date of change
Aluminum	76.00	76.00	
	(Nom.)	80.00	1/4/82
Copper (C)	79.00-80.00	80.00	7/18/83
Lead	19.00-23.00	20.00	
		23.00	7/12/83
Magnesium Ingot	138.00	134.00-	
		138.00	6/1/83
Nickel	329.00	350.00	11/25/81
Titanium Sponge	555.00-	555.00	
	585.00		4/29/82
Zinc	40.00	38.00-	
		40.00	4/27/83

ALUMINUM: 99.5% COPPER (C) = cathode. LEAD: common grade. MAGNESIUM: 99.8% pig. Velsco, Tex. NICKEL: electro., Port Colborne, Canada. ZINC: high grade.

Antimony, American Laredo, Texas	\$2.00
Beryllium-aluminum 5% Be, per lb. contained Be	\$215.00
Beryllium-copper, per lb. cont. Be	\$130.00
Beryllium 97% powder 200	\$166.00
Bismuth, ton lots	\$1.65-\$1.75
Cadmium, under one ton	\$1.05-\$1.15
Calcium, ton lots, crown	\$3.05
Chromium, 99.8%	\$3.75
Cobalt, 99%, cathode	\$12.50
Gold per troy oz.	\$422.40
Indium, dollars per troy oz.	\$3.50
Iridium, dollars per troy oz.	\$600
Magnesium sticks, 10,000 lbs.	\$1.91
Mercury, per 76-lb. f.o.b. N.Y.	\$275-\$285
Molybdenum, lb. tech. moly oxides, 20 lb. MO can	\$5.85

Nickel oxide sinter at U.S. points of entry	\$3.12
Palladium, per troy oz.	\$140
Platinum, per troy oz.	\$475
Rhodium, per troy oz.	\$600.00
Silver ingots, per troy oz.	\$12.06
Vanadium	\$4.94
Zirconium sponge	\$12.00-\$17.00

(Per lb. unless otherwise noted)

Straits Tin Price

(U.S. cents per lb. EX-SMELTER, based on daily market in Penang in Malaysian dollars per kilo.)

July 11—303.08	July 14—596.82
July 12—Holiday	July 15—592.23
July 13—Holiday	

Scrap Prices

Brass Mill Scrap

(Cents per lb; over 20,000 lbs. add 1¢ per lb)

	Solids	Turning
Copper	75½	66¼
Yellow brass	64¼	61½
Red brass	69½	65½
Comm. bronze	71	67
Mang. bronze	63	61¼
Free cutting rod ends	59	58

Custom Smelters Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	70
No. 2 copper wire	62
Light copper	53

Ingot Makers Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	66
No. 2 copper wire	58
Light copper	49
No. 1 composition	56
No. 1 comp. turnings	54
Hvy. yellow brass solids	35
Hvy. yellow brass turnings	28
Radiators	47

Steel Production, Composite Prices

(Effective July 18, 1983)

	Last Week	Two Weeks Ago	To Date 1983	To Date 1982
U.S. Steel Production				
Net tons, in thousands	1,605	1,581	43,637	44,009
Capability Utilization Rate	55.7	54.9	53.6	53.0

Composite Prices

	This Week	Week Ago	Month Ago	Year Ago
Finished Steel Base* (\$/lb.—eff. 2/14/83)	26.217	26.217	26.217	25.297
Pig Iron** (Net ton = 2000 lbs.)	\$213.00	\$213.00	\$213.00	\$213.00
Scrap No. 1 hvy.* ** (Gross ton = 2240 lbs.)	\$ 71.50	\$ 71.50	\$ 70.83	\$ 56.17
No. 2 bundles	\$ 45.50	\$ 45.83	\$ 46.17	\$ 41.83

Scrap Comparison (Gross Ton)

No. 1 steel, Pittsburgh	\$ 74.50	\$ 74.50	\$ 72.50	\$ 59.50
No. 1 steel, Philadelphia	68.50	68.50	68.50	59.50
No. 1 steel, Chicago	71.50	71.50	71.50	49.50
No. 1 bundles, Detroit	71.50	71.50	71.50	52.50
Low Phos., Youngstown	77.50	77.50	75.50	63.50
No. 1 mach'y cast., Pgh.	74.50	74.50	74.50	71.50
No. 1 mach'y cast., Phila	95.50	98.50	98.50	100.50
No. 1 mach'y cast., Chi	108.50	108.50	108.50	101.50

*Finished Steel Composite

Weighted index of steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.

**Pig Iron Composite

Based on average prices for basic and foundry pig iron at representative producing points within the U.S.

***Steel Scrap Composite

Average of No. 1 hvy. melting steel scrap and No. 2 bundles delivered to consumers at Pittsburgh, Philadelphia and Chicago.

Aluminum		
New mixed clips	42	—43
Old sheet	39	—40
Old cast	39	—40
Clean dry borings	40	—41

Dealers' Scrap

(Dealers' buying price f.o.b. New York in cents per pound)

Aluminum		
Segregated clippings	34	—35
Mixed L.C. clips	29	—30
Old sheets and cast	27	—28
Borings and turnings	19	—20
Duraluminum clippings	28	—29

Copper and Brass

No. 1 copper wire	61	—62
No. 2 copper wire	54	—55
Light copper	48	—49
Radiators	38	—39
No. 1 composition	49	—50
No. 1 composition turn'gs	45	—46
Cocks and faucets	34	—35
Clean heavy yellow brass	32	—33
Brass Pipe	33	—34
New soft brass clippings	48	—49

Lead

Heavy soft lead	9	—10
Whole batteries	3	—4
Type metal	15	—16
Electrotype	13	—14

Nickel

Nickel solids	110	—120
Nickel rod ends	110	—120
Nickel sheets, clips	110	—120
Nickel turnings	50	—60

Zinc

New zinc clippings	15	—16
Old diecast zinc	9	—10

MATERIALS NEWSFRONT

(Effective July 18, 1983) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated. Prices are the opinions of Iron Age editors and correspondents, based on contacts with dealers, brokers, generators and users in the industry on the effective date listed above.

Ferrous Scrap Prices

Pittsburgh

No. 1 hvy. melting	\$ 74.00 to \$ 75.00
No. 2 hvy. melting	64.00 to 65.00
No. 1 dealer bundles	90.00 to 91.00
No. 1 factory bundles (auto)	87.00 to 88.00
No. 2 bundles	51.00 to 52.00
No. 1 busheling	87.00 to 88.00
Machine shop turn.	7.00 to 8.00
Shoveling turnings	26.00 to 27.00
Cast iron borings	25.00 to 26.00
Low phos. punchings plate	88.00 to 89.00
Heavy turnings	64.00 to 65.00
No. 1 RR hvy. melting	88.00 to 89.00
Rails 2 ft. and under	103.00 to 104.00
Scrap rails, random lgth.	86.00 to 87.00
RR specialties	95.00 to 96.00
No. 1 machinery cast	74.00 to 75.00
Cupola cast	67.00 to 68.00
Heavy breakable cast	30.00 to 31.00
Stainless	
18-8 bundles and solids	600.00 to 610.00
18-8 turnings	500.00 to 510.00

Chicago

No. 1 hvy. melting	\$ 71.00 to \$ 72.00
No. 2 hvy. melting	66.00 to 67.00
No. 1 dealer bundles	86.00 to 87.00
No. 1 factory bundles (auto)	87.00 to 88.00
No. 2 dealer bundles	44.00 to 45.00
No. 1 busheling	86.00 to 87.00
Shredder scrap	84.00 to 85.00
Machine shop turn.	17.00 to 18.00
Mixed bor. and turn.	18.00 to 19.00
Shoveling turnings	24.00 to 25.00
Cast iron borings	40.00 to 41.00
Low phos. forge crop	89.00 to 90.00
Low phos. punchings plate	
1/4 in. and heavier	98.00 to 99.00
Low phos. 2 ft. and under	95.00 to 96.00
No. 1 RR hvy. melting	82.00 to 83.00
Scrap rails, random lgth.	83.00 to 84.00
Reroller rails	92.00 to 93.00
Rails, 2 ft. and under	94.00 to 95.00
RR couplers and knuckles	82.00 to 83.00
RR car axles	114.00 to 115.00
No. 1 machinery cast	108.00 to 109.00
Cupola cast	95.00 to 96.00
Stove plate	90.00 to 91.00
Steel car wheels	85.00 to 86.00
Stainless	
18-8 bundles and solids	560.00 to 570.00
18-8 turnings	480.00 to 470.00
430 bundles and solids	135.00 to 140.00
430 turnings	100.00 to 105.00

Philadelphia

No. 1 hvy. melting	\$ 67.00 to \$ 70.00
No. 2 hvy. melting	54.00 to 57.00
No. 1 dealer bundles	78.00 to 81.00
No. 2 dealer bundles	39.00 to 42.00
No. 1 busheling	78.00 to 81.00
Shredder scrap	80.00 to 83.00
Machine shop turn.	23.00 to 26.00
Mixed bor. and turn.	23.00 to 26.00
Shoveling turnings	40.00 to 43.00
Low phos. 5 ft. and under	77.00 to 80.00
Low phos. 2 ft. punchings	90.00 to 93.00
Electric furnace bundles	93.00 to 96.00
RR specialties	81.00 to 84.00
Rails, 2 ft. and under	92.00 to 95.00
Cupola cast	57.00 to 60.00
Heavy breakable cast	53.00 to 56.00
No. 1 machinery cast	94.00 to 97.00

Detroit

Broker buying prices per gross ton on cars:	
No. 1 hvy. melting	\$ 53.00 to \$ 54.00
No. 2 hvy. melting	51.00 to 52.00
No. 1 dealer bundles	71.00 to 72.00
No. 2 bundles	36.00 to 37.00
No. 1 busheling	69.00 to 70.00
Drop forge flashings	45.00 to 46.00
Machine shop turn.	25.00 to 26.00
Mixed borings and turn.	15.00 to 16.00
Shoveling turnings	25.00 to 26.00
Cast iron borings	15.00 to 16.00
Heavy breakable cast	34.00 to 35.00
Mixed cupola cast	50.00 to 51.00
Automobile cast	73.00 to 74.00
Stainless	
18-8 bundles and solids	470.00 to 480.00
18-8 turnings	350.00 to 360.00
430 bundles and solids	115.00 to 125.00

Youngstown

No. 1 hvy. melting	\$ 67.00 to \$ 70.00
No. 2 hvy. melting	58.00 to 62.00
No. 1 dealer bundles	80.00 to 83.00
Machine shop turn.	1.00 to 3.00
Shoveling turnings	5.00 to 8.00
Low phos. plate	76.00 to 79.00
Electric furnace bundles	71.00 to 74.00
Galvanized bundles	61.00 to 64.00

Cleveland

No. 1 hvy. melting	\$ 60.00 to \$ 63.00
No. 2 hvy. melting	32.00 to 35.00
No. 1 dealer bundles	79.00 to 82.00
No. 1 factory bundles	82.00 to 85.00
No. 2 bundles	22.00 to 25.00
No. 1 busheling	79.00 to 82.00
Machine shop turn.	1.00 to 4.00
Mixed bor. and turn.	1.00 to 4.00
Shoveling turnings	3.00 to 6.00
Cast iron borings	8.00 to 9.00
Cut structural & plates,	
2 ft. and under	97.00 to 100.00
Low phos. punchings plate	97.00 to 100.00
Drop forge flashings	37.00 to 40.00
Foundry steel, 2 ft. & under	57.00 to 60.00
No. 1 RR hvy. melting	77.00 to 80.00
Rails, 2 ft. and under	102.00 to 105.00
Rails, 18 in. and under	103.00 to 106.00
Steel axle turnings	67.00 to 70.00
Railroad cast	80.00 to 83.00
No. 1 machinery cast	67.00 to 90.00
Cupola cast	60.00 to 63.00
Stove plate	45.00 to 48.00
Stainless	
18-8 bundles	325.00 to 335.00
18-8 turnings	275.00 to 285.00
430 bundles	80.00 to 85.00

Buffalo

Broker buying prices per gross ton on cars:	
No. 1 hvy. melting	\$ 38.00 to \$ 39.00
No. 2 hvy. melting	31.00 to 32.00
No. 1 busheling	50.00 to 51.00
No. 1 dealer bundles	48.00 to 50.00
No. 2 bundles	26.00 to 27.00
Machine shop turn.	12.00 to 13.00
Mixed bor. and turn.	13.00 to 14.00
Shoveling turnings	15.00 to 16.00
Cast iron borings	12.00 to 13.00
Low phos. plate	58.00 to 60.00
Structural and plate,	
2 ft. and under	58.00 to 59.00
Rails, 2 ft. and under	62.00 to 63.00
Scrap rails, random lgth.	50.00 to 51.00
No. 1 machinery cast	67.00 to 68.00
No. 1 cupola cast	48.00 to 49.00

St. Louis

No. 1 hvy. melting	\$ 63.00 to \$ 64.00
No. 2 hvy. melting	52.00 to 53.00
Foundry steel, 2 ft.	52.00 to 53.00
No. 1 dealer bundles	63.00 to 64.00
No. 2 bundles	49.00 to 50.00
Machine shop turn.	12.00 to 13.00
Shoveling turnings	18.00 to 19.00
Cast iron borings	30.00 to 31.00
No. 1 RR hvy. melting	69.00 to 70.00
Rails, random length	69.00 to 70.00
Rails, 18 in. and under	84.00 to 85.00
RR specialties	80.00 to 81.00
Cupola cast	70.00 to 71.00
Heavy breakable cast	48.00 to 49.00
Stove plate	75.00 to 76.00
Cast iron car wheels	49.00 to 50.00
Reroller rails	92.00 to 93.00
Unstripped motor blocks	55.00 to 56.00

Birmingham

No. 1 heavy melting	\$ 67.00 to \$ 68.00
No. 2 heavy melting	61.00 to 62.00
No. 1 dealer bundles	67.00 to 68.00
No. 2 bundles	45.00 to 46.00
No. 1 busheling	67.00 to 68.00
Shredder scrap	81.00 to 82.00
Machine shop turn.	24.00 to 25.00
Shoveling turnings	32.00 to 33.00
Cast iron borings	32.00 to 33.00
Electric furnace bundles	64.00 to 65.00
Elec. furnace, 3 ft. & under	61.00 to 62.00
Structural and plate, 2 ft.	86.00 to 87.00
Structural and plate, 4 ft.	81.00 to 82.00
No. 1 RR hvy. melting	67.00 to 68.00
Scrap rails, random lgth.	68.00 to 69.00
Rails, 18 in. and under	85.00 to 86.00
Angles and splice bars	82.00 to 83.00
No. 1 cupola cast	84.00 to 85.00
Unstripped motor blocks	59.00 to 60.00

Cincinnati

Brokers buying prices per gross ton on cars:	
No. 1 hvy. melting	\$ 58.00 to \$ 59.00
No. 2 hvy. melting	55.00 to 56.00
No. 1 dealer bundles	85.00 to 86.00
No. 2 bundles	29.00 to 30.00
Machine shop turn.	7.00 to 8.00
Shoveling turnings	10.00 to 11.00
Cast iron borings	14.00 to 15.00
Low phos. 18 in. and under	83.00 to 84.00
Rails, random length	68.00 to 69.00
Rails, 2 ft. and under	86.00 to 87.00
No. 1 cupola cast	67.00 to 68.00
Heavy breakable cast	34.00 to 35.00
Drop broken cast	77.00 to 78.00

New York

Brokers buying prices per gross ton on cars:	
No. 1 hvy. melting	\$ 34.00 to \$ 35.00
No. 2 hvy. melting	30.00 to 32.00
No. 2 dealer bundles	22.00 to 23.00
Mixed bor. and turn.	7.00 to 8.00
Machine shop turn.	4.00 to 5.00
Shoveling turnings	10.00 to 12.00
Clean cast. chem. borings	34.00 to 35.00
No. 1 machinery cast	86.00 to 90.00
Mixed yard cast	38.00 to 39.00
Heavy breakable cast	14.00 to 15.00
Stainless	
18-8 prepared solids	490.00 to 510.00
18-8 turnings	390.00 to 410.00
430 prepared solids	70.00 to 80.00
410 solids	60.00 to 70.00

Boston

Brokers buying prices per gross ton on cars:	
No. 1 hvy. melting	\$ 38.00 to \$ 40.00
No. 2 hvy. melting	29.00 to 30.00
No. 1 dealer bundles	44.00 to 46.00
No. 2 bundles	29.00 to 31.00
No. 1 busheling	44.00 to 46.00
Shredder scrap	43.00 to 45.00
Machine shop turn.	3.00 to 5.00
Shoveling turnings	7.00 to 9.00
No. 1 machinery cast	100.00 to 105.00
Mixed cupola cast	28.00 to 30.00
Heavy breakable cast	8.00 to 10.00

San Francisco

No. 1 hvy. melting	\$ 42.00 to \$ 44.00
No. 2 hvy. melting	34.00 to 36.00
No. 1 dealer bundles	29.00 to 31.00
No. 2 dealer bundles	13.00 to 15.00
Machine shop turn.	6.00 to 8.00
Cast iron borings	6.00 to 8.00
No. 1 cupola cast	85.00 to 87.00

Los Angeles

No. 1 hvy. melting	\$ 41.00 to \$ 43.00
No. 2 hvy. melting	30.00 to 32.00
No. 1 dealer bundles	28.00 to 30.00
No. 2 dealer bundles	10.00 to 12.00
Machine shop turn.	6.00 to 8.00
Shoveling turnings	10.00 to 12.00
Cast iron borings	8.00 to 10.00
Elec. furnace, 1 ft. and under	
(foundry)	86.00 to 88.00
No. 1 cupola cast	88.00 to 90.00

Seattle

No. 1 hvy. melting	\$ 59.00 to \$ 61.00
No. 2 hvy. melting	48.00 to 50.00
No. 2 bundles	38.00 to 40.00
No. 1 cupola cast	94.00 to 96.00
Mixed yard cast	81.00 to 83.00

Hamilton, Ont.

Brokers buying price per net ton on cars:	
No. 1 heavy melting	\$ 55.00
No. 2 heavy melting cut 2 ft. and under	52.00
No. 1 dealer bundles	60.00
No. 2 bundles	30.00
Mixed steel scrap	34.00
Bush. new fact. prep'd.	58.00
Bush. new fact. unprep'd.	50.00
Machine shop turn.	25.00
Short steel turn.	28.00
Mixed bor. and turn.	15.00
Cast scrap	48.00

Houston

Brokers buying prices per gross ton on cars:	
No. 1 hvy. melting	\$ 64.00 to \$ 65.00
No. 2 hvy. melting	48.00 to 50.00
No. 2 bundles	31.00 to 32.00
Machine shop turn.	18.00 to 19.00
Crushed turnings	34.00 to 36.00
Shredder scrap	64.00 to 65.00
Cut structural plate 2 ft. and under	82.00 to 85.00
Unstripped motor blocks	56.00 to 58.00
Cupola cast	71.00 to 73.00

STEEL PRICES

Codes identify Producers listed in the Key on page 65. (Prices quoted are mill base prices in cents per pound unless otherwise noted and do not reflect extras or surcharges.) N.A. = Not available.

Billets, Blooms, Slabs

(Dollars per net ton)	
Carbon Re-rolling, Midwest	
W5	\$366.00
N4	\$366.00
West	
C6	\$346.00
Carbon Forging, East	
B3(3), C10, U1	\$453.00
R3	\$453.00
Midwest	
R3, U1, W5	\$453.00
S1	\$453.00
C10	\$453.00
K2	\$453.00
W5	\$453.00
West	
B3(2)	\$483.00
C6	\$453.00
South	
A7	\$453.00
Alloy, East	
R3, C10	\$492.00
B3	\$492.00
Midwest	
W8, W5, C10	\$492.00
S1, U1	\$492.00
R3	\$492.00
West	
B3	\$502.00
C6	\$489.00
South	
A7	\$492.00

Piling Sheet Steel

(cents per lb)	
Midwest	
U1	26.45

Structurals

Carbon, East	
B3(2)	23.90
U1, J3	23.90
Midwest	
A7	24.15
C20	22.90
W8	22.90
I3, T10, U1, N4	23.90
West	
C6	25.10
U1	24.40
B3(2)	21.65
South	
C16, U1	23.90
T10	22.90
A8	Cmp*
High-Strength, Low Alloy, East	
B3(2)	23.90
U1, J3	23.90
Midwest	
N4	23.90
W8	24.15
U1	23.90
I3	23.90
West	
U1, A7	24.40
B3(2)	21.65
South	
U1, C16	23.90
Wide Flange, Carbon, East	
B3	23.90
U1, A7, J3	23.90
Midwest	
U1	23.90
N4	23.90
I3	23.90
West	
U1	24.40
C6	24.15
South	
A7	24.15

Strip

Hot-Rolled, Carbon, Cut II	
Edge—all widths, East	
B3, U1	22.05
J3	22.05
Midwest	
A7, D1	22.05
I4	21.45
S1, J3, D1	22.05
W3	22.05
N4	22.55
W5	22.05
U1	22.05
B3, G2, I3, M2, R3, G3	22.05
West	
K1	20.80

B3	24.70
South	
R3	22.05
Cold-Rolled, Carbon Max. 25%, East	
E4	29.75
R7, S10, B4	29.60
P15	24.80
S7	Cmp*
U1	35.30
D1(1)	Cmp*
B4	31.55
Midwest	
G4	24.80
I4	35.30
W14	22.95
S1, J4	34.05
T4	Cmp*
Composite pricing	
West	
U1	33.25
High-Strength, Hot-Rolled, Low Alloy, Cut Edge & Mill Edge—all widths, (plus extras)*	
Midwest	
M2, G3, R3, W3, I4, J3, G2, I3	22.05
A7	22.05
S1	22.05
West	
K1	22.05
South	
R3	22.05
High-Strength, Cold-Rolled, Low Alloy, Mill Edge, East	
R7	29.00
Midwest	
S1	32.00
Alloy, Hot-Rolled, Midwest (plus extras)*	
S1	24.60
G4	25.80
I4	23.70
Alloy, Cold-Rolled, East	
C11, E4, M8	43.35
R7	32.75
B4	42.60
P15	32.10
Midwest	
I4	41.80
S1	42.30

Sheets

Hot-Rolled, Carbon (18 Ga & Hvyr), East	
B3	22.05
J3	22.05
Midwest	
A7, U1, B3, G2, G3, I3, M2, R3, W3	22.05
S1, W5, D1	22.05
J3	22.05
I4	21.15
West	
U1	21.30
K1	22.05
South	
R3	22.05
Cold-Rolled, East, Class I	
B3(2), U1	26.15
J3	26.15
Midwest	
B3, I3, G3, R3, M2, U1(2)	26.15
G2, W3, M11	26.15
I4	22.00
J3, A7	26.15
S1, W5, D1	26.15
West	
U1	26.65
South	
R3	24.65
Galvanized (hot-dipped), East	
B3(2), U1	28.00
Midwest	
J3, D1	28.00
I3, W5, S1	28.00
U1, A7, R3, Y1	28.00
G2, W3, M11	28.00
West	
K1	27.15
U1	28.50
South	
U1	28.00
R3	28.00
Enameling, Midwest	
A7, I3, U1, J3	27.65
S1	26.50
Long-Term, Midwest	
W5	28.30
A7, U1	29.35
R3	29.35
†Actual weight basis	

Wire Rod

East	
B3(2)	22.35
U1	22.35

Midwest	
N4	22.35
U1, K2	22.35
West	
A7	22.00
C6	21.45
B3	23.25
South	
G7	22.35

Tinplate

Electrolytic Tinplate	
Single Reduced (70 lb)	
East	
B3, J3	per base box
U1	\$26.29
Midwest	
B3	\$26.29
U1	26.29
West	
J3	26.29
M11	26.29
W3	26.29
W5	26.29
South	
K1	\$26.79
U1	26.79
Double Reduced (55 lb)*	
Midwest	
M11 (50 lb)	\$21.49
B3, J3	21.49
U1	21.49
W3	21.49
W5	21.49
West	
K1	\$21.99
U1	21.99
South	
U1	\$21.49
Black Plate	
Single Reduced (75 lb)*	
East	
B3	\$24.01
Midwest	
J3	\$24.01
M11	24.01
I3, U1, W5	24.01
W3	24.01
West	
K1	\$24.01
U1	23.36
Double Reduced (55 lb)	
East	
B3	\$18.93
Midwest	
M11	\$18.93
W5, U1	18.93
J3	18.93
W3	18.93
W5	18.93
West	
U1	\$18.93
South	
U1	\$18.93
*50 lb—base weight extra 45¢	
*50 lb—base weight extra \$1.40	

Bars

Carbon Steel, Hot-Rolled	
(Special quality)	
East	
R3, K3	25.80
R5	25.80
B3(2), J3	25.80
U1, C10	25.80
Midwest	
A7	23.95
U1, I3, I4, C20, N4	25.80
R3, T10	25.80
K2	25.80
I3	19.50*
West	
B3	25.80
C6	24.45
B3	24.70
South	
A8	20.65
A7	25.80
C16	25.80
Cold-Finished Carbon, East	
A11	22.15
R3	33.75
C21, L2	21.15
J3(4), L2	31.00
C2	23.025
M8, W10, T11, S8	31.00
N1	24.475
R4	22.25
B4	31.00
M1	23.025
B4, C10	31.00
Midwest	
B5, W10, Y1, W8, R3	33.25
J3	31.00
B1	19.80
N3	30.75
L2	31.00
P3	19.85 + CMS
W14	22.20
J3(3)	31.00

B5	31.25
J3	31.00
West	
B5	31.20
B5	34.90
R3	37.15
South	
B5	32.85
J3	34.00
C16	24.40
J3	31.95
Alloy, Hot-Rolled, East	
B3(2), R5, K3, C10, U1	27.95
R3	27.95
J3	27.95
Midwest	
A7, U1, R3	27.95
I3, C10	27.95
I4	24.85
I3	21.00*
West	
B3	27.95
B5	18.50
C6	26.80
B3	27.10
South	
A7	24.85
A8	22.00
Alloy, Cold Drawn, East	
L2	35.20
R3, N1, C2	37.90
M1	28.025
R4	25.65
A11	30.50
J3, W10, L2	34.85
T11, S8	34.85
C10	34.85
J3(2)	34.25
Midwest	
B5, R3, C10	37.35
C2	28.275
J3, M9, W10	34.85
P3	22.75
B1	22.70
N8	34.85
L2	34.85
B5	35.10
J3	36.00
J3	34.85
West	
R3	40.75
B5	35.20
B5	38.25
South	
J3	35.85
C16	28.00
B5	36.75

Plates

Carbon Steel, East	
B3(2), U1	25.75
L4	25.75
P2	25.75
J3	26.75
Midwest	
B3, R3, S1	25.75
I3	24.25
J3, A7	22.80
U1, I4	25.75
R3	26.75
West	
A7, B3, C6, C2	24.25
K1	23.50
U1	25.75
South	
R3	25.75
A7	25.75
U1	25.75
Alloy, East	
B3, J3	33.55
U1, L4	33.55
P2	33.55
J3	34.55
Midwest	
B3	33.55
G2, G3	33.55
I4, U1	33.55
West	
B3	33.55
C2	30.55
K1	31.30
South	
A7	27.55

Wire

Carbon Steel Wire, East	
B3(2)	27.10
U1	27.70
A11	22.15
Midwest	
U1	27.70
A7, R3	24.80
N4, W7	27.40
K2	24.20
South	
A8	22.85
West	
A7	25.95
C6	24.95

STEEL PRICES

Producer Key With Principal Offices

A4 American Cladmetals Co., Carnegie, Pa.
A7 Armco Inc., Middletown, Ohio
A8 Atlantic Steel Co., Atlanta, Ga.
A11 Atlantic Wire Co., Branford, Conn.

B1 Baron Drawn Steel Corp., Toledo, Ohio
B3 Bethlehem Steel Corp., Bethlehem, Pa.
B4 Blair Strip Steel Co., New Castle, Pa.
B5 Bliss & Laughlin Steel Co.,
Harvey, Ill.

C1 Calstrip Corp., Los Angeles
C6 CF&I Steel Corp., Pueblo, Colo.
C10 Copperweld Steel Co., Warren, Ohio
C11 Crucible Divisions, Colt Industries,
Pittsburgh, Pa.
C15 G. O. Carlson, Inc., Thorndale, Pa.
C16 Connors Steel Co., Birmingham, Ala.
C20 Calumet Steel Div., Chicago Heights, Ill.
C21 Cumberland Steel Co., Cumberland, Md.

D1 Detroit Strip Div., Cyclops Corp.
D2 Driver Wilber B. Co., Newark, N. J.
D3 Driver Harris Co., Harrison, N. J.

E3 Enamel Products & Plating Co., McKeesport, Pa.
E4 Elliot Bros. Steel Co., New Castle, Pa.

F1 Firth Sterling, Inc., McKeesport, Pa.

G2 Granite City Steel Co., Granite City, Ill.
G3 Great Lakes Steel Division, National Steel Corp.,
Ecorse, Mich.
G4 Greer Steel Co., Dover, O.
G5 Green River Steel Corp., Owensboro, Ky.
G6 Gibraltar Steel Corp., Buffalo, N. Y.
G7 Georgetown Steel Corp., Georgetown, S. C.
G8 Guterl Special Steel Corp.

H1 Hercules Drawn Steel Corp., Livonia, Mich.

I2 Ingersoll Steel Div., New Castle, Ind.
I3 Inland Steel Co., Chicago, Ill.
I4 Interlake Steel Corp., Chicago

J2 Jessop Steel Corp., Washington, Pa.
J3 Jones & Laughlin Steel Corp., Pittsburgh
J4 Joslyn Mfg. & Supply Co., Chicago
J5 Judson Steel Corp., Emeryville, Calif.

K1 Kaiser Steel Corp., Fontana, Calif.
K2 Keystone Consolidated Industries, Inc.
K3 Kentucky Electric Steel Co., Ashland, Kentucky
K5 Kemco Div., Foote Mineral Co., Keokuk, Iowa

L2 La Salle Steel Co., Chicago
L3 Lone Star Steel Co., Dallas
L4 Lukens Steel Co., Coatesville, Pa.
L5 Litho-Strip Corp., Chicago

M2 McLouth Steel Products Corp.
M4 Mid States Steel & Wire Co.,
Crawfordsville, Ind.
M8 Mill Strip Products Div., National Steel Service
Center, National Steel Corp.

M9 Moltrup Steel Products Co., Beaver Falls, Pa.
M11 Midwest Steel Div., National Steel Corp.,
Portage, Ind.

N1 Northeast Precision Steel Co., Boston, Mass.
N4 Northwestern Steel & Wire Co., Sterling, Ill.
N6 Northwest Steel Rolling Mills, Seattle, Wash.
N9 Nelsen Steel & Wire Co., Chicago, Ill.
N10 North Star Steel Co., Saint Paul, Minnesota

O2 Oregon Steel Mills, Portland, Ore.

P2 Phoenix Steel Corp., Claymont, Del.
P3 Wyckoff Steel Div., Plymouth, Mich.
P9 Pacific States Steel Co., Niles, Cal.
P13 Penn Dixie Steel Corp., Kokomo, Ind.
P14 Pacific Tube Co., Los Angeles
P15 Philadelphia Steel and Wire Corp., Phila.

R3 Republic Steel Corp., Cleveland
R4 Ramco Steel Co., Buffalo, N. Y.
R5 Roblin Steel Corp., Inc., North Tonawanda, N. Y.
R6 Rodney Metals, Inc., New Bedford, Mass.
R7 Rome Strip Steel Co., Rome, N. Y.

S1 Sharon Steel Corp., Sharon, Pa.

S7 Stanley Works, New Britain, Conn.
S8 Superior Drawn Steel Co., Monaca, Pa.
S10 Seneca Steel Service, Buffalo, N. Y.
S16 Southern Precision Steel Co., Gulfport, Miss.

T4 Thomas Steel Strip Co., Warren, O.
T5 Timken Company, Steel Division, Canton, O.
T7 Texas Steel Co., Fort Worth, Tex.
T9 Triumph Electro Corp., Chicago, Ill.
T10 Tennessee Forging Steel Corp.,
Harriman, Tenn.
T11 Teledyne Columbia-Summerill, Carnegie, Pa.

U1 United States Steel Corp., Pittsburgh, Pa.

W3 Weirton Steel Division, National Steel Corp.,
Weirton, West Va.
W5 Wheeling-Pittsburgh Steel Corp.
W7 Wilson Steel & Wire Co., Chicago
W10 Wyckoff Steel Div., Ampco-Pittsburgh Corp.,
Pittsburgh, Pa.
W14 Whittaker Steel Strip Div., Detroit, Mich.

Steel Service Center Prices

Price, Dollars per 100 lb

City Delivery Charge	Cities*	Sheets			Strip	Plates	Shapes	Bars		Alloy Bars			
		H-Rolled (10 gage)	Cold-Rolled (20 gage)	Galvanized (16 gage)	Hot-Rolled Strip	Plates	Standard Structurals	Hot-Rolled (merchant)	Cold Finished	Hot-Rolled 8620 As Rolled	Hot-Rolled 4140 Annealed	Cold-Drawn 8620 As Rolled	Cold-Drawn 4140 Annealed
	Atlanta	22.23	28.98	31.18	31.63	21.61	24.68	17.33	33.40	42.16	52.00	69.58	73.19
	Baltimore	26.67	28.19	35.29	37.30	24.85	26.64	19.19	36.65	55.85	59.91	69.79	76.32
	Birmingham	21.92	29.13	31.27	32.10	21.48	24.36	17.14	31.75	49.31	68.90	68.16	74.43
	Boston	25.11	29.66	34.62	45.11	35.11	37.52	20.95	41.20	48.40	52.69	62.29	67.33
	Buffalo	26.09	34.26	38.86	42.37	33.04	28.77	17.80	41.10	39.03	48.82	56.33	64.06
	Chicago	23.30	32.19	34.80	33.75	23.67	26.21	15.94	32.66	37.01	42.32	50.07	58.70
	Cincinnati	24.85	29.72	33.23	34.55	24.63	28.78	15.20	30.51	35.17	40.02	45.20	51.15
	Cleveland	27.47	32.64	33.35	33.08	25.73	26.01	16.01	32.92	36.76	41.57	46.44	52.48
	Denver	33.10	40.58	37.48	41.88	34.45	35.59	21.42	41.86	51.78	59.12	67.82	70.99
	Detroit	25.06	31.96	32.35	36.92	27.28	34.81	19.47	38.44	35.65	39.68	56.96	51.26
	Houston	33.42	31.40	34.58	41.97	32.24	38.36	17.85	39.48	39.28	45.22	53.75	60.10
	Kansas City	25.26	31.98	34.70	30.64	27.34	28.84	17.57	34.14	40.72	51.71	57.20	64.82
	Los Angeles	26.33	33.68	35.61	44.73	36.10	35.90	32.26	46.36	61.48	66.52	75.05	88.80
	Memphis	28.23	36.53	36.43	36.92	27.28	34.81	19.47	38.44	52.82	56.96	67.85	77.44
	Milwaukee	24.20	31.40	33.85	32.90	24.56	28.00	15.71	33.04	35.61	41.88	46.30	53.45
	New York	24.20	30.17	33.20	43.39	29.93	33.54	19.99	42.13	46.59	53.04	62.17	69.31
	Philadelphia	28.39	35.11	36.92	46.96	30.86	35.97	19.70	38.64	46.41	52.66	62.06	69.23
	Pittsburgh	26.55	32.66	35.16	41.36	32.45	29.51	20.41	41.30	46.51	54.05	61.11	68.88
	Portland	28.64	37.02	40.05	31.11	31.04	35.30	32.60	53.96	61.00	64.10	78.49	
	San Francisco	26.75	35.79	37.06	41.13	35.37	35.72	29.03	48.02	57.61	69.41	77.07	84.10
	Seattle	27.74	33.94	36.56	42.00	29.35	31.37	29.55	50.60	63.37	71.57	78.28	87.67
	Spokane	21.00	30.34	34.28	37.91	33.00	33.75	21.80	43.01	43.20	47.52		58.32
	St. Louis	25.28	31.06	33.30	35.96	27.25	29.68	16.09	33.14	38.46	43.65	51.02	57.48
	St. Paul	24.77	30.26	33.05	35.73	28.33	28.12	15.45	34.33	36.60	41.88	46.58	53.31

Base Quantities. All HR products may be combined for quantity. Hot-rolled sheet, 10 ga x 36 x 96—120; Cold-rolled sheet, 20 ga x 36 x 120; Galv. sheet—16 ga x 36—120; Hot-rolled strip—1/4" x 1"; Plate 1/4" x 84"; Shapes—Beams 6 x 12.5; Hot-rolled bar—Rounds 1/4-2 1/2"; Cold finished bar—C 1018—1" rounds; Alloy bar—Hot-rolled 8620—1 1/2" round; Cold drawn—1" round; Hot-rolled 4140—1 1/2" round; Cold drawn—1" round. Check local supplier for additions or deductions from base.

*Prices at all points include metropolitan delivery charges.